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Development of Mathematical Worksheets Based on Scientific Approaches for Elementary School Students

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abstract

Development of Mathematical Worksheets Based on Scientific Approaches for Elementary School Students. This study aims to develop supporting teaching materials, namely student worksheets in class IV mathematics subjects, especially about the perimeter and area of square, rectangular and triangle. The type of this research is using Research and Development (RnD) that using the 4D model (Four D Model) (define, design, develop, and disseminet). The subjects of this study were 1 teacher and 25 fourth grade students at SDN Serang 02. Data in this study were collected by tests, questionnaires, and documentation. Data analysis carried out is qualitative and quantitative. The results of the study obtained an average value of expert validation with an average score of 86.5% and included a very feasible category, the average value of teacher responses to worksheets was 86.2% with a very good category and the average response value of students was 86, 1% with a very good category and an average comprehension test score of 81.4 with a very good understanding category. Based on these data it can be concluded that the mathematical worksheet oriented scientific approach can be used in learning because it is considered feasible to be used as supporting teaching material in mathematics learning and is able to facilitate students' understanding of the material " perimeter and area of square, rectangular and triangle ".

Keywords:
Worksheets; Saintific; Mathematics

INTRODUCTION

Learning planning must contain learning tools prepared, including understanding the curriculum, mastering teaching materials, compiling learning programs, implementing learning programs and assessing learning programs, implementing learning programs and evaluating learning programs that have been implemented. One of the tools that must be prepared in learning planning is to master teaching materials. According to Majid (2014), teaching materials are a set of materials that are arranged systematically so as to create an environment or atmosphere that allows students to learn well. Teaching materials are grouped into 4 types namely printed materials, teaching materials, teaching materials for hearing sight and interactive teaching materials. The use of appropriate teaching materials must also be accompanied by the implementation of appropriate learning as well. One of the implementation of learning that can support the implementation of good teaching materials is to use a scientific approach.

Based on the results of the analysis of the needs of student worksheets (LKS) to 15 students of SDN Serang 02 as a sample, the following information was obtained: teaching materials used in mathematics learning are only in the form of textbooks, most of the material listed in textbooks is understandable but the packaging the book is less interesting in the colors and pictures. If the learning climate like this continues to take place, then to improve students' linkages to mathematics teaching materials will not be achieved, therefore the results of the needs analysis show that there are 86.6% of students who choose supporting teaching materials in the form of worksheets for learning mathematics. When compared with conventional worksheets that use opaque paper, without color, students expect the support of teaching materials in the form of worksheets that is equipped with interesting pictures, activities and coloring.

Based on the results of interviews conducted with the fourth grade teacher at SDN Serang 02, information was obtained that the teaching materials used during the mathematics learning process were only textbooks or other supporting books. He explained that once in a while he made a worksheet for one time learning but it was made if needed. He also stated that the conventional worksheets currently in circulation still needed improvement, this was because the contents of the worksheets were not for activities to be completed by students but rather for the material and questions. This causes the activeness of students in learning to use worksheets to not develop. The paper used in conventional LKS is opaque paper with which students are less interested in learning to use LKS. The teacher hereby approves the development of the conventional LKS with the hope that the developed LKS is packaged with an attractive appearance and content that is in accordance with the characteristics of students and is able to develop student activity in learning.

Based on the analysis of these needs, it is necessary to implement learning that can meet the needs of students, one of which is the learning process using a scientific approach that is

closely related to the implementation of the 2013 curriculum. The ultimate goal of a scientific approach is that students find learning experiences that are appropriate to the needs and interests of students. The scientific approach is a learning process that has been designed so that students can actively build concepts, laws or principles through the stages of observing, formulating problems, formulating hypotheses, collecting data with a variety of techniques, analyzing data, drawing conclusions, and communicating concepts, laws or principles found (Hosnan, 2014).

The scientific approach requires a pleasant learning process and activities based on the principle, one of the teaching materials that can be used for is the use of student worksheets (worksheets). LKS are sheets that contain instructions, steps to complete a task (Majid, 2014). According to Lismawati (2010) LKS has several benefits that can support the needs of students, among others: LKS can be learned anywhere and anytime without having to use special tools, can develop students' ability to learn about facts and be able to explore general and abstract principles by using realistic arguments, it can disperse words, numbers, musical notations, two-dimensional drawings, and diagrams with a very fast process and is economically more economical compared to other learning media. With the principles of the scientific approach, students are expected to be able to process information independently. The existence of teachers or educators is actually only as a facilitator in the learning process in the 2013 curriculum.

With this problem, it is important to develop a student worksheet (LKS) in accordance with the demands of the 2013 curriculum, so researchers try to provide solutions to overcome this problem by "Developing Mathematical Worksheets Based on Scientific Approaches for Elementary Students".

LITERATURE REVIEW

a. Student worksheet (LKS)

Student worksheets (LKS) are printed teaching materials in the form of sheets of paper containing material, summaries, and instructions for implementing learning tasks that students must do, both theoretical or practical, that refer to the basic competencies that must be achieved by students and its use depends on other teaching materials (Prastowo, 2014: 268). Majid stated the same thing that student activity sheets are sheets containing tasks to be done by students that contain instructions, steps to complete a task that leads to the basic competencies to be achieved (Majid, 2014).

It was explained that the student activity sheet was also a guide for students which contained a set of basic activities that students had to do to maximize understanding in an effort to form basic abilities according to indicators of learning achievement that had to be taken (Trianto, 2014). In contrast to Trianto, Arsyad argues that worksheets for students both in intracuricular and co-curricular activities are used to facilitate understanding of the learning material obtained (Arsyad, 2004). Ordinary student activity sheets contain sheets containing guidelines for students to carry out programmed activities so students can do them actively (Trianto, 2014: 243). Based on the various LKS explanations above, it can be seen that the LKS is a student worksheet that contains material, questions, instructions, and assignments aimed at students so that students can better understand the material that has

been learned and can be used as a guide book in working on activities.

Based on the regulations of the Ministry of National Education in preparing teaching materials in the form of worksheets like there are several steps that must be carried out as follows:

1. Conduct Curriculum Analysis

Curriculum analysis is the first step in the preparation of worksheets. This step is intended to determine which materials require LKS teaching materials. In general, in determining the material, the analysis step is carried out by looking at the subject matter, learning experience, and the material to be taught. Next, look at the competencies students must have. If all of these steps have been taken, then the next step is to compile a map of the needs of student activity sheets.

2. Compiling the LKS Requirement Map

The LKS needs map is really needed to know the number of LKS that must be written after seeing the sequence or sequence of the LKS. LKS sequences are needed in determining writing priorities. This step usually begins with curriculum analysis and analysis of learning resources.

3. Determine the LKS Titles

Please note that the worksheet titles are determined on the basis of basic competencies, basic materials, or learning experiences contained in the curriculum. A basic competency can be used as an LKS title if the competency is not too large, while the magnitude of the basic competency can be detected, among others by means of if it is broken down into the subject matter to obtain a maximum of 4 subject matter, then the competency can be used as a worksheet title. However, if those basic competencies can be broken down into more than 4 main subjects, then it must be rethought whether those basic competencies need to be broken down into two LKS titles. If the worksheet titles have been determined, then the next step is to start writing.

4. Writing LKS

To write LKS, there are a number of steps that must be taken, including formulating basic competencies, determining research tools, compiling material, and paying attention to the LKS structure (Prastowo, 2014).

According to Hendro Darmodjo and Jenny R.E, the existence of worksheets has a significant influence in the learning process, so the preparation of worksheets must meet various requirements, namely the conditions of inactivity, construction requirements and technical requirements (Widjajanti, 2008).

1. Dicttive Terms

The requirements for active instruction governing the use of universal LKS can be used well for students who are slow or smart. The worksheet emphasizes more on the process of finding concepts as well as the variety of stimuli through various media and student activities. LKS is made to prioritize the development of social, emotional, moral and aesthetic communication skills. The learning experience experienced by students is determined by the student's personal development goals.

The conditions for the active preparation of quality worksheets that can invite students actively in the learning process, emphasize the process of finding concepts, have a variety of stimuli through various media and student

activities, and can develop social, emotional, moral, and aesthetic communication skills on themselves students with personal development goals.

2. Construction Requirements

Construction requirements are conditions relating to the use of language, sentence structure, vocabulary, difficulty level, and clarity, which in essence must be appropriate in the sense that it can be understood by the user, namely students. The construction requirements are using language that is appropriate to the level of maturity of the child, using clear sentence structures and having a sequence of lessons according to the child's ability level. Try the questions contained in the worksheet are open-ended questions and do not refer to source books that are beyond the readability of students.

Providing enough space to give students the freedom to write and draw on the worksheet is one of the deductive requirements that must be met, plus the provision of a frame where the child must write answers or draw as instructed. This can also make it easier for teachers to check student work. The use of simple and short sentences can guarantee clarity of instructions or content. Use more illustrations than words. Images are closer to the nature of concrete while words are closer to the nature of "formal" or abstract so it is more difficult to catch by children.

Can be used by children, both slow and fast, have clear goals and are useful as a source of motivation, have an identity to facilitate administration for example, classes, subjects, topics, names or names of group members, dates and so on.

3. Technical Requirements for LKS Arrangement

Technical requirements emphasize the presentation of the worksheet, which is in the form of writing, pictures and appearance in the worksheet. Good writing in LKS is to use printed letters and not to use Latin or Roman letters, rather large bold letters for the topic. Use short sentences, no more than 10 words in one line. Use abbreviations to distinguish command sentences from students' answers, and try to compare the letter size with the matching picture size. While good images for worksheets are images that can convey messages or the contents of these pictures effectively to users of worksheets, not forgetting the appearance is also one of the important aspects in the worksheet, children will first be interested in the appearance not the content.

b. Scientific approach

The approach is a basic concept that embodies, inspires, reinforces, and underpins thinking about how learning methods are applied based on certain theories (Hamruni, 2012). According to Hosnan the scientific approach is a learning process that has been designed so that students can actively build concepts, laws or principles through stages of observing, formulating problems, formulating hypotheses, collecting data with a variety of techniques, analyzing data, drawing conclusions, and communicating the concepts, laws or principles found (Hosnan, 2014).

In essence, learning with a scientific approach requires students to be able to apply scientific methods, namely digging knowledge through observing, classifying, predicting, designing, carrying out experiments, communicating their knowledge to others by using thinking skills, and using scientific attitudes such as curiosity, care- heart, objective and honest (Sujarwanata, 2012). The scientific

approach is also intended to provide understanding to students in knowing, understanding various materials using a scientific approach, that information can come from anywhere, anytime, not dependent on information from an educator or teacher (Diani, 2016).

Meaningfulness in the learning process becomes a very important thing to be obtained by students in order to build individual character. If further explained the scientific approach is a scientific framework of learning that is carried by the 2013 curriculum. The scientific approach consists of 5 (five) steps, namely observing, asking, gathering information, associating, and communicating.

c. Mathematics Learning

Mathematics becomes one of the fields of science, has values and concepts. It is undeniable that many fields of science use mathematical concepts for their development. In addition, mathematics is needed to improve students' reasoning to be able to think critically, logically, rationally, carefully, honestly, effectively and efficiently. Mathematics is a universal science that underlies the development of modern technology, and certainly has a very important role in various scientific disciplines in advancing the power of human thought. Maulana stated that by learning mathematics students will be equipped with the knowledge, skills and disposition of thinking by which they are equipped to meet the demands of community and state life, be able to compete fairly and be able to work together with other nations and in solving all problems of life in critical thinking and creative (Fadhilaturrahmi: 2017).

According to Jhonson and Myklebust (Abdurrahman, 2012), mathematics is a symbolic language that functions practically to express quantitative relationships and spaces while the theoretical function is to facilitate thinking. Likewise with Purwanto who argued that mathematics arises because of human thought relating to ideas, processes, and mathematical reasoning which consists of arithmetic, algebra, geometry of analysis. Mathematics is knowledge that is compiled consistently using deductive logic. Based on the explanation of mathematics, it can be understood that mathematics is a science that is related to the problems of everyday life, to practice high reasoning abilities, think logically, creatively and analyze.

According to Hamalik mathematics learning for students is a form of thinking, understanding and reasoning from daily life. Learning is a combination that is composed including human elements, materials, facilities, equipment, and procedures that affect each other to achieve learning objectives (Hamalik, 2011). In the learning process, both teachers and students jointly become actors of the implementation of learning objectives. Based on what was stated by Widdiharto (2004) the goal of mathematics learning is the formation of the internal ability of students through the ability to think critically, logically and systematically in solving a problem in everyday life. Mathematics learning is an individual process for thinking and reasoning in solving a mathematical problem related to everyday life properly.

Based on the previous explanation, mathematics is one of the fields of science, has values and concepts. It is undeniable that many fields of science use mathematical concepts for their development. In addition, mathematics is

needed to improve students' reasoning abilities to be able to think critically, logically, rationally, carefully, honestly, effectively and efficiently. The main element of mathematical work is deductive reasoning which works on the basis of assumptions. In addition, mathematics also works through inductive learning that is made aware of facts and symptoms that appear to arrive at certain estimates. But this estimate, must still be proven in a deductive and consistent argument.

At the elementary school age (7-8 and 12-13 years) according to Piaget's cognitive theory including the concrete operational stage, based on this cognitive development, elementary school-age children in general have difficulty understanding abstract mathematics, because mathematical abstractness is not easy understood by elementary school students in general. The 2004 Ministry of National Education curriculum states that the standard of mathematics competence in elementary schools that students must possess after conducting learning activities is not mathematics, but what is needed is to be able to understand the world around, be able to compete and succeed in mathematical life.

The competency standards formulated in this curriculum include understanding mathematical concepts, mathematical communication, mathematical connections, reasoning and problem solving, as well as positive attitudes and interests towards mathematics, therefore teaching mathematics must be done in stages. Learning mathematics must start from the concrete stage, then be directed to the semi-concrete stage, and in the end students can think and understand mathematics in the abstract.

METHODS

This research uses research and development methods (Reasearch and Development). The research development method used in this study refers to the research design of the 4D model (Four D Model), the 4D model consists of 3 stages of development, namely: the defining stage, the planning stage, the development stage and the deployment stage (disseminator) (Trianto, 2014: 93).

a. Time, Place of Target / Research Subject

The place of research was conducted at Serang 02 Public Elementary School located at Ki Mas Jong No.1, Serang City, Banten. The time of the study was conducted from November 2018 to March 2019 from the initial observation, proposal writing to reporting the research report. The target or research subjects involved in this study consisted of 25 students in grade IV and 1 teacher in grade IV.

b. Research procedure

This development research uses the 4D model (Four D Model), the 4D model consists of 4 stages of development, namely: the defining stage, the planning stage, the development stage and the dissemination stage. The define stage includes curriculum analysis activities, student analysis, needs analysis, material analysis and formulating learning objectives to be achieved. The design phase includes the planning activities of making drafts in the form of storyboards and designing research instruments. The develop phase includes product development activities as well as validation by a team of experts. The dissemination phase is carried out on a limited basis.

c. Data, Instruments, Data Collection Techniques, and Analysis

The types of data used in this study are questionnaires, documentation, and understanding tests. The instruments used in this study were expert validation questionnaires, user response questionnaires and comprehension tests that had made instrument instruments. The main purpose of a study is to obtain data. Therefore, the data collection technique is a strategic step in the research process as a data collector to be described in the study. Data collection techniques in this study used a validation questionnaire, a user response questionnaire, an understanding test and documentation of learning implementation. Data analysis in research Reasearch and Development consists of qualitative and quantitative analysis techniques. Qualitative analysis is used to describe the results of expert validation by revising based on expert advice, analyzing teacher and student response data to the Mathematical Approach Based on Scientific Approaches. Quantitative analysis is used to determine student understanding based on the results of the given understanding test.

RESULT AND DISCUSSION

a. Description of test result

The results of the research on the development of mathematical worksheets based on the scientific approach are explained based on the flow of research with the 4D research model (Four D Model), the 4D model consists of 4 stages of development namely: the defining stage, the planning stage, the development stage (develop)) and the dissemination stage described as follows:

The defining stage

This stage includes an analysis of the needs of teaching materials, curriculum, material, students and formulating goals. Analysis of needs at this stage is an analysis of teaching materials conducted by collecting information using interviews with teachers and questionnaires aimed at teachers and fourth grade students of SDN Serang 02. The results of interviews and questionnaires given to teachers and students show that the teaching materials used in class IV SDN Serang 02 using a textbook. The process of learning mathematics at SDN Serang 02 does not use conventional LKS. Teachers and students need supporting teaching materials in the form of mathematical worksheets based on a scientific approach to the surrounding material and the area of a flat rectangular, rectangular and triangular building in the hope that learning will become more meaningful and make it easier for students to understand the material.

Curriculum analysis is carried out by identifying core competencies, basic competencies in fourth grade mathematics subjects according to the 2013 curriculum syllabus, then determining indicators and learning objectives according to student characteristics which include background knowledge and cognitive development of students. From these stages the surrounding material and the area of the square, rectangular and triangle triangles are chosen. Based on the analysis of student characteristics, the introduction of various kinds of flat shapes has been learned by students in grade 1 and learning about the operation of multiplication related to the circumferential material and the area of flat build has been studied previously, this will be one of the supporting materials for students in understanding the surrounding material and flat wake area.

The planning stage (design)

The design stage or planning for LKS preparation is adjusted to the product criteria that pay attention to the feasibility of the media, material and linguistic aspects. These criteria are adjusted to the requirements for the preparation of LKS according to Hendro Darmodjo and Jenny R.E (Widjajanti, 2008), namely the conditions for inactivity, construction requirements, and technical requirements.

The preparation of this worksheet is also based on the principles of a scientific approach consisting of 5 stages, namely observing, questioning, gathering information, associating and communicating. In the observation phase, the worksheet presents activities to observe various things related to the circumference or the width of a flat building. This activity is intended so that students are accustomed to exploring their curiosity so that learning will be more meaningful. According to Ridlo observing method is very useful for the fulfillment of student curiosity, so the learning process has a high meaningfulness. With the observation method students can find the fact that there is a relationship between the object being analyzed with the learning material used by the teacher. Observing activities listed in the worksheet are observations on the images relating to the circumference and width of the flat build. In the picture students are given a narrative text on matters relating to the concept of traveling and broad which invites students to start thinking deeper about the meaningfulness of the subject.

The next stage is asking questions, the questioning activities listed in the worksheet show questions raised or other questions that come from students' thoughts. Students are given the freedom to ask questions or measure their abilities related to the extent of the thought process that is owned when observing activities.

The next stage is gathering information, this activity is carried out by digging information from various activities or sources through various means. The activity of gathering information contained in the worksheet includes activities that require students to take an active role in each activity, starting from measuring, calculating, and conducting various experiments. Information gathering activities become a source of all information needed by students to reach understanding.

The next step is to associate, this activity is a reasoning activity. Reasoning is drawing conclusions from information that has been obtained previously. Reasoning or associating activities listed in LKS are deductive reasoning activities. Students are asked to be able to draw conclusions from information that is still in the form of general understanding into understanding formula.

a. Media Validation

The media experts in this study were Mr. Eko Wahyu Wibowo, S.Sc., M.Sc as a lecturer at the Department of Teacher Education in the Islamic Elementary School of Banten UIN Banten and Mr. A.Syachruroji, M.Pd as a lecturer in the Department of Teacher Education at Untirta Primary School. This mathematical worksheet is validated by both validators with the following validation results:

Table 1 Results of Media Expert Validation

AssessmentAspects	Score	Validator I	Skor	Validator II
		Percentage (%)		Percentage (%)
Media Information	39	86,6 Very decent	42	93,3 Very decent

Based on the results of the validation of the two media experts above, obtained the results of the assessment of the validator of media expert I with a percentage of 86.6% which is included in the very feasible category and the results of the assessment of the validator of media expert II with a percentage of 93.3% included in the very feasible category . The data shows that the mathematical worksheets based on a scientific approach to the circumferential material and the area of a square, rectangular and triangular flat are included in the category very feasible from the media aspect. Researchers also get some advice from media experts in perfecting the worksheets that have been produced, here are some suggestions from media experts and follow-up conducted by researchers:

Table 2 Suggestions and Follow-up Media Experts

Validator	Suggestion	Folloe-up
I	Add the title or name of the activity to the top of the activity in accordance with the table of contents so that the activity is more directed .	Add the title or name of the activity to the top of the activity in accordance with the table of contents.
II	• Add symbols that characterize the 5 M activities of the characters in each activity observing, asking questions, gathering information, associating and communicating. • Preparation of bibliography according to the rules of writing.	• Add symbols that characterize the 5 M activities of the characters in each activity observing, asking questions, gathering information, associating and communicating. • Compile bibliography according to the rules of writing.

b. Material Validation

Material experts in this study are Mr. Khaeroni, S.Sc., M.Sc as a lecturer at the Department of Teacher Education at the Islamic Primary School of Banten UIN Banten and Mrs. Wida Rachmiati, S.Pd., M.Pd, a lecturer at the Department of Teacher Education at the Islamic Primary School of Islamic Education, Banten UIN. This mathematical worksheet is validated by both validators with the following validation results:

Table 3: Expert Material Validation Results

Assessment Aspects	Score	Validator I	Skor	Validator II
		Percentage (%)		Percentage (%)
Material Information	43	86 Very decent	38	76 decent

Based on the results of the validation of the two material experts above, an assessment of the material expert I obtained with a percentage of 86% included in the very feasible category and the results of the assessment of the material expert validator II with a percentage of 76% included in the feasible category. The data shows that the mathematical worksheets based on a scientific approach to the circumferential material and the area of a square, rectangular and triangular flat are included in the category very feasible from the material aspect. Researchers also get some advice from media experts in perfecting the worksheets that have been produced, here are some suggestions from material experts and follow-up conducted by researchers:

Table 4 Suggestions and Follow-up on Expert Material

Validator	Suggestion	Follw-up
I	Adjust the associated activities to activity 1.	Adjust the associated activities to activity 1.
II	• Adjust the associated activities to activity 1. • Add the HOTS (Higher order Thinking Skill) questions to the evaluation questions.	• Adjust activities associated with the activity 1. Compile a bibliography according to the rules of writing. • Adds HOTS (Higher order Thinking Skill) questions to evaluation questions.

c. Language Validation

Linguists in this study were Mrs. Rina Yuliana, M.Pd as a lecturer in the Untirta Elementary School Teacher Education Department and Yoma Hatima, M.Pd as a lecturer in the Untirta Elementary School Teacher Education Department. This mathematical worksheet is validated by both validators with the following validation results:

Table 5 Language Expert Validation Results

Assessment Aspects	Score	Validator I	Score	Validator II
		Percentage (%)		Percentage (%)
Material Information	44	88 Very decent	45	90 Very decent

Based on the results of the validation of the two linguists above, the assessment results obtained from the linguist validator I with a percentage of 88% included in the very feasible category and the results of the assessment of the validator linguist II with a percentage of 90% included in the very feasible category. The data shows that the mathematical worksheets based on a scientific approach to the circumferential material and the area of a square, rectangular and triangular flat are included in the category very feasible from the aspect of language. Researchers also get some advice from linguists in perfecting the worksheets that have been produced, here are some suggestions from linguists and follow-up conducted by researchers:

Table 6 Suggestions and Follow-up of Linguists

Validator	Suggestion	Follow-up
I	• Improvelanguageandwordsthat do not fit the level of students' cognitivedevelopment. • Fixsomeineffectiveeditorials	• Improve language and some words that are not in accordance with the level of cognitive development of students. • Improve ineffective sentence editorials.
II	• Fix some ineffective words. • Improve punctuation in writing.	• Fix ineffective words. • Improve punctuation in writing.

d. User Response (Teacher and Student)

Response questionnaire was given to 2 users, namely teachers and students. Teacher responses were given to 1 teacher in grade IV SDN Serang 02 and student responses were given to 25 students in grade IV SDN Serang 02. The teacher's response to the mathematics worksheets based on the scientific approach was obtained using the questionnaire responses given directly and the data obtained were presented in the table following:

Table 7 Data Analysis of Teacher Response Results

No.	AssessmentAspects	Score	Percentage (%)	Information
1.	Media	32	88,9	The Best
2.	Material	33	82,5	The Best
3.	Language	35	87,5	The Best

Table 7 shows that the results of the teacher's response to the mathematics worksheet based on the scientific approach were very good. This is indicated by the results of the assessment of aspects of the media which scored 88.9%, 83.5% of material aspects and 87.5% of language aspects where the three aspects fall into the very good category.

Student responses to mathematical worksheets based on the scientific approach were obtained using a student response questionnaire given after the end of the learning process. The data obtained is presented in the following table:

Table 8 Analysis of Student Response Results Data

No.	AssessmentAspects	Score	Percentage (%)	Information
1.	Media	119	95,2	The Best
2.	Material	157	89,7	The Best
3.	Language	47	94	The Best

Table 8 shows that the results of student responses to mathematical worksheets based on scientific approaches are very good. This is indicated by the results of the assessment of aspects of the media which obtained a value of 95.2%, material aspects of 89.7% and aspects of language 94% where all three aspects fall into the very good category.

e. Understanding Test

Student understanding test consists of 5 essay items and is given after the implementation of learning using LKS on February 27, 2019. The indicator of understanding test success is if students get an understanding value of $60 < N \leq 80$ with a good category. The data obtained is presented in the following table:

Table 9 Analysis of Data on Understanding Test Results

Student Comprehension Test	QuestionNumber					Score
	1	2	3	4	5	
Final Score	77,6	81,2	92,8	94,4	80	81,4
Information	Good	The Best	The Best	The Best	Good	The Best

Table 9 shows the lowest average value obtained by students from the test results of students' understanding of the material after using a scientific approach-based math worksheet found in item number 1 aitu 77.6 and the highest average value 94.4 in item number 4 of and the average value of all students is 81.4 and shows a very good understanding category.

b. Discussion

Based on the results of research that has been done, the results of interviews and questionnaires stated that the fourth grade teacher at SDN Serang 02 approved the development of a scientific approach oriented math worksheet. This is based on the fact that teaching materials in mathematics used in the school are only textbooks. Previously, the school did not use conventional worksheets in mathematics, but teachers usually make worksheets for one learning. The textbooks and worksheets made by the teacher do not list the requirements for good worksheets. Not listed activities with a scientific approach to the learning approach of the 2013 curriculum.

Based on the results of the needs analysis, students prefer LKS to be one of the supporting teaching materials in learning mathematics. Reflecting on the conventional worksheets in circulation, students need a more colorful worksheet and there are activities that students must do. Therefore, to meet the needs of students, researchers develop worksheets in which there are activities.

This is consistent with the theory proposed by Trianto (2014) that ordinary student activity sheets contain sheets containing guidelines for students to carry out programmed activities so students can do them actively. In addition to being able to carry out active learning activities, Majid (2014) states that student activity sheets are also sheets containing tasks to be done by students that contain instructions, steps to complete a task that leads to basic competencies to be achieved.

The need for worksheets that must contain activities that students can do actively during the learning process makes researchers develop mathematical worksheets in accordance with the 2013 curriculum and the approach inherent in the curriculum is a scientific approach. According to Hosnan (2014) a scientific approach is a learning process that has been designed so that students can actively develop concepts, laws or principles through stages of observing, formulating problems, formulating hypotheses, collecting data with a variety of techniques, analyzing data , draw conclusions, and communicate the concepts, laws or principles found.

Sujarwanata (2012) states that the nature of learning with a scientific

approach requires students to be able to apply scientific methods, namely digging knowledge through observing, classifying, predicting, designing, conducting experiments, communicating their knowledge to others by using thinking skills, and using scientific attitude such as curiosity, caution, objective and honest. Therefore, this mathematical worksheet is based on a scientific approach with the material "circumference and area of a square, rectangular and triangular shape".

The development of this mathematics worksheet is packed with designs that are able to attract the attention of students. The choice of text or writing is adjusted to the type and size that students are able to read clearly. Packaging colors, images, frames and layout in this worksheet is adjusted to the needs. This is in accordance with what was stated by Muljono (2007) that a good textbook is physically presented in the form of an attractive appearance and illustrates the characteristics of textbooks, easy to read and use. In addition, according to the Ministry of National Education (2008), pictures that support the content of the material are very necessary in teaching materials, because in addition to clarifying explanations, it can also add attraction for students to learn them.

The language used in worksheets is made according to the level of cognitive development of students. The sentences used are simple, structured, communicative and interactive. This is in accordance with the opinion of Muljono (2007) which states that a good textbook is a book that contains information, messages and knowledge as outlined in written form and can be communicated logically to the reader, easily accepted according to the cognitive development stage of the reader or the user.

The achievement or feasibility of a mathematical worksheet based on a scientific approach is proven through validation from media, material and language experts with the following results: validator media expert I gives a value with a percentage of 86.6% and validator media expert II gives a value with a percentage of 93.3%. Material expert validator I gives a value of 86% and 76% of material expert validator II. While the linguist validator I gives a value of 88% and the linguist validator II gives a value of 90%. As a whole the mathematical worksheets based on the scientific approach get a percentage of 86.5% of the maximum percentage of 100%. The description shows that the mathematics worksheet based on scientific approach for elementary students is included in the very good category according to media, material and language experts, so that this worksheet can be used in learning because it is considered suitable as a supporting teaching material in mathematics learning.

After a mathematical worksheet based on a scientific approach was declared feasible by experts, the product began to be distributed or used in the learning process. The learning process using this worksheet is carried out 2 times dated 26 and 27 February 2019. At the beginning of learning, students are asked to form groups with a maximum number of members of 5-6 people. Then, the researcher made an apperception about square, rectangular and triangle flat shapes. The researcher asks students to write the names of group members in the "identity" section available in the worksheet. Then, students are asked to

follow the stages of the activities listed in the worksheet. Researchers as facilitators for students while doing various activities, students are given the opportunity to discuss and ask questions that are not understood.

Based on the learning process that takes place using a scientific worksheet based on a scientific approach to the material around the square and rectangular and rectangular building area in the fourth grade of SDN Serang 02, students look active in carrying out various activities contained in the worksheets both individually and in groups. this is also proven by research conducted by Dewi (2013) and states that the learning process using LKS can open as wide opportunities as possible to students to actively participate in learning. Based on this, it can be concluded that the use of mathematical worksheets based on a scientific approach to the circumferential material and the area of a square, rectangular and triangular shape in the learning process can activate students.

After the learning process using a mathematical worksheet based on a scientific approach, researchers gave questionnaire responses to 1 teacher and 25 grade IV SDN Serang 02. Based on the responses obtained, it was known that the teacher's response to the developed worksheets scored a percentage of 88.9% in aspects media, 82.5% in the material aspect and 87.5% in the language aspect, so an average score of 86.2% was obtained with a very good category. Based on the results of the responses given by the teacher, the aspect of the media is the highest percentage. This shows that teachers are very interested in the worksheets that are developed. The teacher states that the cover design, the accuracy of the use of fonts, the size of the writing on the worksheet is very good. The accuracy of using images and colors is also very good. The accuracy of using frames and layout in the worksheet is very good.

Furthermore, students' responses to the worksheets developed received a score of 95.2% in the media aspect, 89.7% in the material aspect and 94% in the language aspect, so an average score of 86.1% was obtained with a very good category . The results of the responses given by students stated that the percentage of attractiveness was highest in the media aspect. This shows that students are very interested in the worksheets developed. The teacher states that the cover design, the accuracy of the use of fonts, the size of the writing on the worksheet is very good. The accuracy of using images and colors is also very good. The accuracy of using frames and layout in the worksheet is very good. Based on the results of user responses teachers and students are interested in the worksheets that have been developed and are able to understand the material well. This is in accordance with the statement of Fitri (2014) that LKS which has a look and design that combines text, images and background LKS with contrasting colors and content that is not boring will attract students' attention and support the learning process.

The scientific approach-based mathematics worksheet was tested on 25 students in grade IV of SDN Serang 02. In this trial, the researcher gave a comprehension test after learning using LKS. The average value obtained by students on the comprehension test was 81.4 which showed a very good understanding category. Overall student understanding is included in the very good category, but of the 5 questions the

highest understanding of students lies in problem number 4 with a value of 94.4 and the second lies in problem number 3 with a value of 92.8 and the third lies in problem number 2 with a value of 81.2.

Students 'understanding of the three questions can be categorized very well, and for questions number 1 and 5 students' understanding is only included in both categories with a value of 77.6 and 80. Based on the average test scores obtained by students students can be stated that the use of mathematical worksheets based on a scientific approach capable of facilitating students' understanding of the material "the circumference and area of a square, rectangular and triangular shape". This is reinforced by the results of the Khasanah study (2016) which states that the worksheet is able to facilitate student understanding with a percentage of more than or equal to 66.67.

Based on the discussion of the results of the development of a mathematical worksheet based on a scientific approach for elementary school students around the square and rectangular flat, rectangular and triangular area, the worksheet is considered to be successfully developed better because it is packaged according to the design and able to provide benefits for learning. This is consistent with the theory put forward by Atmojo (2012) that floating is an effort that is done consciously, planned, directed to make or improve something so that it is more beneficial to improve quality and better quality.

CONCLUSION AND IMPLICATION

Based on the results of research and discussion, it can be concluded as follows:

Development of a mathematical worksheet based on a scientific approach developed through the 4D (Four D Model) model (define, design, develop and disseminated) is motivated by the needs of students on supporting teaching materials namely LKS that is interesting and includes activities in mathematics subjects .

The results of validation by media, material and language experts obtained an average score of 86.5% with a very decent category. In addition, the results of teacher responses obtained an average score of 86.2% in the excellent category and student responses obtained an average score of 86.1% in the very good category. Based on this, it can be concluded that the mathematical worksheets based on scientific approaches to the circumferential material and the area of a square, rectangular and triangular building are suitable for use in the learning process.

The understanding test after learning using a mathematical approach worksheet based on the scientific approach obtained an average score of 81.4 which indicates a very good understanding category. Based on the average value of understanding tests obtained by students, it can be stated that the use of mathematical worksheets based on a scientific approach is able to facilitate students' understanding of the material "the circumference and area of a flat square, rectangular and triangle".

Based on the conclusions above, it is recommended:

Mathematical worksheets oriented to the scientific approach can be one alternative supporting teaching material to train students in understanding the material "the circumference and area of a flat rectangular, rectangular and triangular building".

For other researchers who will conduct expert testing or product validation, it should be printed in small amounts in advance to avoid wasting costs, labor and research time.

It is expected to develop media or teaching material with a different subject matter, so that it can become a media or supporting material for other learning materials.

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